

WHAT IS CLAIMED IS:

1. A polarization beam splitting optical system, comprising:

a polarization splitting film which guides polarized light from a first optical system to a reflection type image forming element and then analyzes and guides polarized light from the image forming element to a second optical system;

wherein the polarization splitting film has a structure which satisfies the following condition:

$$120^\circ \leq |\delta| \leq 180^\circ;$$

where  $\delta$  is the phase difference of P-polarized light and S-polarized light at the polarization splitting film.

2. The polarization beam splitting optical system according to Claim 1, wherein further satisfies the following condition:

$$R_p > 0\%;$$

where  $R_p$  is the reflectance, at the polarization splitting film, of the P-polarized light that is incident on the polarized splitting film at an angle  $\theta$  with respect to a normal to the polarization splitting film, the incidence angle  $\theta$  satisfying the condition:

$$\alpha - \psi \leq \theta \leq \alpha + \psi;$$

where  $\alpha$  is an angle formed by an optical axis leading

from the first optical system to the polarization splitting film and the normal to the polarization splitting film, and  $\psi$  is a maximum incidence angle of light incident onto the polarization splitting film with respect to the optical axis leading from the first optical system to the polarization splitting film.

3. The polarization beam splitting optical system according to Claim 1, wherein

the polarization splitting film is disposed so as to be inclined with respect to an optical axis of the first optical system.

4. The polarization beam splitting optical system according to Claim 1, wherein

a 1/4-wave plate is disposed between the polarization splitting film and the image forming element.

5. The polarization beam splitting optical system according to Claim 1, wherein

$\delta$  is the phase difference of P-polarized light and S-polarized light at a point of reflection at the polarization splitting film.

6. The polarization beam splitting optical system

according to Claim 1, wherein

the polarization splitting film has a structure by which the polarization direction of polarized light that is incident on the polarization splitting film at an angle  $\theta$  with respect to a normal to the polarization splitting film and at a first azimuth angle and that is reflected by the polarization beam splitting film, is between:

(i) the polarization direction of polarized light that is reflected at the polarization splitting film, which is determined based on the geometrical relationship of the polarization splitting film and the direction of incidence of polarized light on the polarization splitting film, and

(ii) the polarization direction of polarized light, after the polarized light has been incident on the polarization splitting film at the angle  $\theta$  with respect to the normal to polarization splitting film and at a second azimuth angle which is directly opposite to the first azimuth angle, and has been reflected at the polarization splitting film and then has passed through a  $1/2$ -wave plate.

7. The polarization beam optical system according to Claim 6, wherein

passing through the  $1/2$ -wave plate means passing through a  $1/4$ -wave plate twice.

8. A polarization beam splitting optical system, comprising:

a polarization splitting film which guides polarized light from a first optical system to a reflection type image forming element and then analyzes and guides polarized light from the image forming element to a second optical system;

wherein the polarization splitting film has a structure by which the polarization direction of polarized light that is incident on the polarization splitting film at an angle  $\theta$  with respect to a normal to the polarization splitting film and at a first azimuth angle and that is reflected by the polarization splitting film, is between:

(i) the polarization direction of polarized light that is reflected at the polarization splitting film, which is determined based on the geometrical relationship of the polarization splitting film and the direction of incidence of polarized light on the polarization splitting film, and

(ii) the polarization direction of polarized light, after the polarized light has been incident on the polarization splitting film at the angle  $\theta$  with respect to the normal to polarization splitting film and at a second azimuth angle which is directly opposite to the first azimuth angle and has been reflected at the polarization splitting film and then has passed through a  $1/2$ -wave plate.

9. The polarization beam optical system according to Claim 8, wherein

passing through the 1/2-wave plate means passing through a 1/4-wave plate twice.

10. The polarization beam splitting optical system according to Claim 8, wherein

a 1/4-wave plate is disposed between the polarization splitting film and the image forming element.

11. The polarization beam splitting optical system according to Claim 8, wherein

the angle  $\theta$  is an angle that is smaller than an angle formed by the polarization splitting film and a plane orthogonal to an optical axis leading from the first optical system to the polarization splitting film.

12. A projection type display optical system comprising:

a first optical system which illuminates light onto a reflection type image forming element;

the polarization beam splitting optical system according to Claim 1; and

a second optical system which projects light from the polarization beam splitting optical system onto a projection surface.

13. A projection type image display apparatus comprising:  
the projection type display optical system according to  
Claim 12; and

a reflection type image forming element which modulates  
the light from the first optical system.

14. An image display system comprising:

the projection type image display apparatus according  
to Claim 13; and

an image information supplying apparatus which supplies  
image information for making the image forming element form  
an original image to the projection type image display  
apparatus.

15. A projection type display optical system comprising:

a first optical system which illuminates light onto a  
reflection type image forming element;

the polarization beam splitting optical system  
according to Claim 8; and

a second optical system which projects light from the  
polarization beam splitting optical system onto a projection  
surface.

16. A projection type image display apparatus comprising:

the projection type display optical system according to Claim 15; and

a reflection type image forming element which modulates the light from the first optical system.

17. An image display system comprising:

the projection type image display apparatus according to Claim 16; and

an image information supplying apparatus which supplies image information for making the image forming element form an original image to the projection type image display apparatus.